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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/053,085	11/09/2001	Raymond J. Gorte	UPFF-0004 / N2437	5527
23377 7590 12/21/2009 WOODCOCK WASHBURN LLP CIRA CENTRE, 12TH FLOOR 2929 ARCH STREET PHILADELPHIA, PA 19104-2891				
EXAMINER WANG, EUGENIA				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
12/21/2009		PAPER		

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/053,085  
Filing Date: November 09, 2001  
Appellant(s): GORTE ET AL.

\_\_\_\_\_  
Aaron B. Rabinowitz  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed December 8, 2009 appealing from the Office action mailed April 10, 2009.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows: claims 58 and 60 are also now canceled (and thus no rejection is applicable).

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

4812329	ISENBERG	3-1989
6423896	KEEGAN	7-2002
6221280	ANUMAKONDA	4-2001
6017647	WALLIN	1-2000
5589285	CABLE	12-1996

### **(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

**Note:** The previous claim objection, 112 rejection, as well as the prior art rejections with respect to claims 58, 60, and 66 have been withdrawn in light of the after final amendment received October 30, 2009. The amendment entered November 17, 2009 and obviates the claim objection and 112 rejection as well as cancels claims 58, 60, and 66, rendering the rejections to such claims moot.

### ***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 2, 3, 5-12, 15, 16, 18, 21, 24-30, 62, and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5445903 (Cable '903) in view of US 4812329 (Isenberg), and US 6423896 (Keegan).

As to claims 62 and 63, Cable '903 teach of a solid oxide fuel cell, wherein the assembly (system) is embodied as well (col. 1, lines 5-8; col. 3, lines 49-52). The fuel cell has a cathode [5], an anode [4], an electrolyte, oxygen, and fuel (col. 3, lines 49-62). (As seen in Table II and col. 11, lines 41-50, air and hydrogen are fed to the

electrode (oxygen (cathode) and fuel (anode), respectively.) The electrolyte is ion transferring and is made of yttria stabilized zirconia (col. 4, lines 57-65). It is noted that yttria stabilized zirconia is inherently an electric insulator.

Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)

In the case of the instant application the basis for expectation of inherency is the fact that it is the same material as Applicant uses and thus must have the same characteristic of being electronically insulating (see spec p10 line 16 to p 11 line 1).

The Examiner requires applicant to provide that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product.

Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to

product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

The anode [4] is porous and has a metal such as nickel or cobalt blended with an oxide power such as zirconia, ceria, yttria, or doped ceria (ceramics) (col. 5, lines 23-26). Therefore, Cable '903 teaches a fuel electrode that does not have nickel in it\*. (Please see \* for an alternate interpretation.)

As seen in fig. 1, the solid electrolyte [6] and the anode [4] are placed next to each other (overlap), in physical contact (and are thus bound to one another), wherein the contact is seen to be an essentially uninterrupted interface.

\*Alternately it can be interpreted that since Cable '903 does not specifically teach an example of a solid oxide fuel cell, wherein there is no nickel in the anode (as example A in col. 10 uses nickel as the metallic powder). However, in this case, the use of other metallic powders besides nickel would have been obvious to one of ordinary skill in the art, as Cable '903 teaches of the use of cobalt instead of nickel (col. 5, lines 23-26). Therefore nickel and cobalt are art recognized equivalents, and it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute cobalt for nickel with the predictable result of it functioning in a solid oxide fuel cell anode as a metallic powder used in the anode.

Cable '903 does not teach of (a) having ceria deposited in the pores of the anode and (b) using a fuel having a sulfur content from about 1-5000 ppm or (c) the fact that the fuel is a hydrocarbon with two or more carbons.

As to (a), Isenberg teaches that the fuel electrode (anode) is porous and is impregnated with cerium nitrate, which results in a porous fuel electrode with ceria ( $(\text{CeO}_2)_{0.8}(\text{La}_2\text{O}_3)_{0.2}$ ) impregnated in the porous electrode (col. 6, lines 12-43). The motivation for using ceria based outer coatings (made by such impregnation, resulting in ceria in the pres) is that ceria doping results in proved sulfur tolerance (col. 1, lines 55-68; col. 2, lines 1-27, 54-56; col. 5, lines 3-9; col. 7, lines 1-20 fig. 6). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to impregnate the fuel electrode of Cable '903 et al. with ceria (which results with ceria in the pores of the anode) in order to improve sulfur tolerance within the fuel cell.

As to (b), it is first noted that Cable '903 embodies a hydrogen fuel (see table II). Isenberg embodies a hydrogen fuel with 50 ppm hydrogen sulfide in it (col. 2, lines 60-67; col. 7, lines 1-20). Such a teaching applies to Cable '903, as Isenberg renders obvious the fact that using a fuel (for example hydrogen) with a 50 ppm sulfur impurity would still result in an operating fuel cell, if ceria were present in the pores. Accordingly, the combination of Cable '903 and Isenberg with respect to (a) (having ceria deposited in the pores) would render obvious the use of such a fuel (hydrogen fuel with a 50 ppm sulfur impurity), since such a substitution of such a fuel would result in the predictable result of function as a fuel in a solid oxide fuel cell. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use a fuel with 50 ppm sulfur impurity, as Isenberg teaches hydrogen fuel, wherein a ceria doped anode would be sulfur tolerant up to at least 50 ppm, and thus

the use of such a fuel in the structure rendered obvious by the combination of Cable '903 and Isenberg would render obvious using such a fuel, since it would have yielded in the predictable result of acting as a functioning fuel in a solid oxide fuel cell. (Note: 50 ppm of hydrogen sulfide is taken to be approximately 50 ppm sulfur, as the weight of the hydrogen portion in hydrogen sulfide is small and negligible.)

As to (c), Keegan teaches a list of possible fuels used in a solid oxide fuel cell system (col. 1, lines 62-64). These fuels include hydrogen (the same fuels embodied by Isenberg and Cable '903) as well as conventional higher hydrocarbon fuels, such as gasoline, diesel, ethanol, kerosene, natural gas, propane, butane, etc. (col. 2, lines 43-45 and 51-60). Accordingly, gasoline, diesel, ethanol, kerosene, natural gas, propane, and butane are all art recognized equivalents for hydrogen for their use as fuels in solid oxide fuel cells (wherein all are hydrocarbons with 2 or more carbons). Furthermore, it is particularly pointed out that the combination of the conventional hydrocarbon fuels can also be combined with the simpler fuels (such as hydrogen) (col. 2, lines 44-65). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use diesel, kerosene, gasoline, ethanol, or natural gas or combinations of the aforementioned with hydrogen as fuel (instead of hydrogen), since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Furthermore, the replacement of art recognized equivalents with one another would result in the predictable result of acting in the same manner (acting as fuel).



It is noted that the fuel cell of the combined teaching of Cable '903 and Isenberg inherently has a method of operation to provide electricity using the apparatus, as discussed above (as applied to claim 63), wherein the reactants are brought in contact with the fuel cell.

It is noted that the fuel cells within the systems/processes of using such defined systems are inherently capable of operating directly with a sulfur-containing hydrocarbon fuel without undergoing treatment to remove sulfur compounds, as such systems are the same as that claimed, barring a showing to the contrary.

As applied to the product claims only:

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson*, 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

As to claims 2, 3, 5, 6, 21, 22, and 24-26 the combination of Cable '903, Isenberg, Keegan teaches the limitation, as Keegan is relied to teach the use of different fuels in a solid oxide fuel cell, for example diesel (as applied to claims 2, 3, 6, 21, 22, and 26), kerosene (as applied to claims 2, 3, 5, 21, 22, 24), and gasoline (as applied to claims 2, 3, 6, 21, 22, and 25) (all of the aforementioned being petroleum distillates, as applied to claim 2) (col. 2, lines 51-55).

As to claims 9 and 27, the combination of Cable '903, Isenberg, Keegan teach the limitation, as Keegan is relied to teach the use of different fuels in a solid oxide fuel cell, for example butane (as applied to claims 9 and 27), as well as ethanol (an alcohol) (as applied to claim 27) (col. 2, lines 51-55).

As to claims 7, 8, 28, and 29, the combination of Cable '903, Isenberg, Keegan teach the limitation, as Keegan is relied to teach the use of different fuels in a solid oxide fuel cell, for example ethanol (col. 2, lines 51-55).

As to claims 10-12 and 30, the combination of Cable '903, Isenberg, and Keegan teach the limitation, as Isenberg renders obvious using a fuel (specifically hydrogen, as used in Cable '903 as well) with 50 ppm hydrogen sulfide in it (col. 2, lines 64-67; col. 7, lines 1-20) and Keegan relied upon to render obvious the replacement of hydrogen fuel with higher hydrocarbon fuels (col. 2, lines 43-65). (Please see part (b) and (c) in the rejection of claims 62, 63, and 65 for a full explanation as to how Isenberg and Keegan to such a teaching.) (Note: 50 ppm of hydrogen sulfide is taken to be approximately 50 ppm sulfur, as the weight of the hydrogen portion in hydrogen sulfide is small and negligible.)

As to claim 15, Cable '903's electrolyte conducts ionized oxygen (oxide ion) (col. 4, lines 57-65).

As to claims 16 and 18, Cable '903's electrolyte is yttria stabilized zirconia (col. 4, lines 57-65).

2. Claims 4, 13, 14, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cable '903 in view of Isenberg and Keegan, as applied to claims 62, 2, 10-12, 63, and 22, in further view of US 6221280 (Anumakonda et al.).

As to claims 4 and 23, the combination of Cable '903, Isenberg, and Keegan do not teach the use of JP-4, JP-5, JP-8, or mixtures thereof as the fuel.

However, Anumakonda et al. teach the use of heavier fuels to be used in solid oxide fuel cells, such as JP-8, JP-4, and JP-5 (abs.; col. 1, lines 10-16; col. 2, lines 38-44; col. 4, lines 5-15). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use heavier fuels (JP-8, JP-4, or JP-5) in a solid

oxide fuel cell, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Note: The claim language for independent claims 62 and 63 only state that fuel cell system is "capable of directly operating with a sulfur-containing hydrocarbon that does not undergo prior treatment to remove organic sulfur compounds." This statement only requires that the fuel cell is capable of operating with such a fuel and does not positively limit hydrocarbon fuel itself. Such an interpretation was applied as to the rejection above. For an alternate interpretation, see \*\*\*, below.

\*\*\* Alternately, it would have been obvious to use heavier fuels (with higher sulfur content - up to 0.3 wt% (3000 ppm) but typically between 0.05- 0.07 (500-700 ppm) (col. 2, lines 38-44)). The motivation for using fuels with jet fuels (JP-4, JP-5, JP-8) with higher sulfur content would lie in the fact that Isenberg teaches that ceria doped anodes can withstand more sulfur impurities. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made, as one of ordinary skill in the art would have been able to appreciate using JP-8, JP-4, and JP-5 in a solid oxide fuel cell without treatment with the predictable result of the fuel cell functioning in the same manner, since Isenberg teaches that ceria doped anodes are more sulfur tolerant.

As to claims 13 and 14, the combination of Cable '903, Isenberg, and Keegan do not teach the use of a sulfur-containing hydrocarbon fuel with a sulfur content from

about 100 -1000 ppm (as required by claim 13) or 250-1000 ppm (as required by claim 14).

However, Anumakonda et al. teach the use of heavier fuels to be used in solid oxide fuel cells, such as JP-8, JP-4, and JP-5, wherein the aforementioned fuels have a sulfur content of about 0.05 to 0.07 wt.% (500-700 ppm) (abs.; col. 1, lines 10-16; col. 2, lines 38-44).

Motivation for using JP-8, JP-4, and JP-5 has been discussed in the rejection of claims 4 and 23 but are reiterated herein for clarity's sake.

Anumakonda et al. teach the use of heavier fuels to be used in solid oxide fuel cells, such as JP-8, JP-4, and JP-5 (wherein the aforementioned fuels have a sulfur content of about 0.05 to 0.07 wt.% (500-700 ppm)) (abs.; col. 1, lines 10-16; col. 2, lines 38-44). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use heavier fuels (JP-8, JP-4, or JP-5) in a solid oxide fuel cell, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Note: The claim language for independent claims 62 and 63 only state that fuel cell system is "capable of directly operating with a sulfur-containing hydrocarbon that does not undergo prior treatment to remove organic sulfur compounds." This statement only requires that the fuel cell is capable of operating with such a fuel and does not positively limit hydrocarbon fuel itself. Such an interpretation was applied as to the rejection above. For an alternate interpretation, see \*\*\*, below.

\*\*\* Alternately, it would have been obvious to use heavier fuels (with higher sulfur content - up to 0.3 wt% (3000 ppm) but typically between 0.05- 0.07 (500-700 ppm) (col. 2, lines 38-44)). The motivation for using fuels with jet fuels (JP-4, JP-5, JP-8) with higher sulfur content would lie in the fact that Isenberg teaches that ceria doped anodes can withstand more sulfur impurities. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made, as one of ordinary skill in the art would have been able to appreciate using JP-8, JP-4, and JP-5 in a solid oxide fuel cell without treatment with the predictable result of the fuel cell functioning in the same manner, since Isenberg teaches that ceria doped anodes are more sulfur tolerant.

3. Claims 17 and 19 rejected under 35 U.S.C. 103(a) as being unpatentable over Cable '903 in view of Isenberg and Keegan, as applied to claims 62, 15, and 16, in view of US 6017647 (Wallin).

As to claims 17 and 19, Cable '903 teaches the use of doped zirconia and doped ceria for the oxide ion conducting electrolyte (col. 4, lines 57-65). Cable '903 does not teach that the electrolyte is gadolinium doped ceria, samarium-doped ceria, yttria-doped ceria, and mixtures thereof (as required by claim 17) or scandium-doped zirconia (as required by claim 19).

Wallin teaches a solid oxide fuel cell, wherein the ionically conductive electrolyte includes yttria-stabilized zirconia (also taught by Isenberg), scandium-doped zirconia (as applied to claim 19), gadolinium-doped ceria (as applied to claim 17) (abs; col. 4, lines 49-59). Therefore, Wallin shows that scandium-doped zirconia, gadolinium-doped

ceria, and yttria-stabilized zirconia are art recognized equivalents. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use either gadolinium-doped ceria or scandium-doped zirconia as the electrolyte, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Furthermore, the replacement of art recognized equivalents with one another would result in the predictable result of acting in the same manner (oxide ion conducting).

4. Claims 55 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cable '903 in view of Isenberg and Keegan, as applied to claims 62, 63, and 65, in further view of US 5589285 (Cable '285).

As to claims 55 and 56, the combination of Cable '903 and Isenberg does not teach the addition of copper into the pores of the anode.

Cable '285 teaches of doping an anode with sulfur-resistance ceria, wherein an electronically conducting phase, such as copper, is added (col. 10, lines 17-31). The motivation for wanting to include copper in the ceria dopant (which would then impregnate the anode) would be to increase the electronic conductivity throughout the fuel cell and thus improve performance. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to add electronically conductive copper to ceria (as taught by Cable '285), wherein the ceria mixture is used to impregnate the anode for sulfur tolerance (as taught by Isenberg) in order to facilitate electronic conductivity and improve fuel cell operation.

5. Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cable '903 in view of Isenberg, Keegan, and Cable '285.

As to claim 64, Cable '903 teach of a solid oxide fuel cell, wherein the assembly (system) is embodied as well (col. 1, lines 5-8; col. 3, lines 49-52). The fuel cell has a cathode [5], an anode [4], an electrolyte, oxygen, and fuel (col. 3, lines 49-62). (As seen in Table II and col. 11, lines 41-50, air and hydrogen are fed to the electrode (oxygen (cathode) and fuel (anode), respectively.) The electrolyte is ion transferring and is made of yttria stabilized zirconia (col. 4, lines 57-65). It is noted that yttria stabilized zirconia is inherently an electric insulator.

Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)



In the case of the instant application the basis for expectation of inherency is the fact that it is the same material as Applicant uses and thus must have the same characteristic of being electronically insulating (see spec p10 line 16 to p 11 line 1).

The Examiner requires applicant to provide that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product.

Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

The anode [4] is porous and has a metal such as nickel or cobalt blended with an oxide power such as zirconia, ceria, yttria, or doped ceria (ceramics) (col. 5, lines 23-26). Therefore, Cable '903 teaches a fuel electrode that does not have nickel in it\*. (Please see \* for an alternate interpretation.)

As seen in fig. 1, the solid electrolyte [6] and the anode [4] are placed next to each other (overlap), in physical contact (and are thus bound to one another), wherein the contact is seen to be an essentially uninterrupted interface.

\*Alternately it can be interpreted that since Cable '903 does not specifically teach an example of a solid oxide fuel cell, wherein there is no nickel in the anode (as example A in col. 10 uses nickel as the metallic powder). However, in this case, the use of other metallic powders besides nickel would have been obvious to one of ordinary

skill in the art, as Cable '903 teaches of the use of cobalt instead of nickel (col. 5, lines 23-26). Therefore nickel and cobalt are art recognized equivalents, and it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute cobalt for nickel with the predictable result of it functioning in a solid oxide fuel cell anode as a metallic powder used in the anode.

Cable '903 does not teach of (a) having ceria deposited in the pores of the anode and (b) using a fuel having a sulfur content from about 1-5000 ppm, (c) the fact that the fuel is a hydrocarbon with two or more carbons, or (d) that copper is deposited in the pores of the anode (as required by claim 64).

As to (a), Isenberg teaches that the fuel electrode (anode) is porous and is impregnated with cerium nitrate, which results in a porous fuel electrode with ceria ( $(\text{CeO}_2)_{0.8}(\text{La}_2\text{O}_3)_{0.2}$ ) impregnated in the porous electrode (col. 6, lines 12-43). The motivation for using ceria based outer coatings (made by such impregnation, resulting in ceria in the pores) is that ceria doping results in proved sulfur tolerance (col. 1, lines 55-68; col. 2, lines 1-27, 54-56; col. 5, lines 3-9; col. 7, lines 1-20 fig. 6). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to impregnate the fuel electrode of Cable '903 et al. with ceria (which results with ceria in the pores of the anode) in order to improve sulfur tolerance within the fuel cell.

As to (b), it is first noted that Cable '903 embodies a hydrogen fuel (see table II). Isenberg embodies a hydrogen fuel with 50 ppm hydrogen sulfide in it (col. 2, lines 60-67; col. 7, lines 1-20). Such a teaching applies to Cable '903, as Isenberg renders

obvious the fact that using a fuel (for example hydrogen) with a 50 ppm sulfur impurity would still result in an operating fuel cell, if ceria were present in the pores. Accordingly, the combination of Cable '903 and Isenberg with respect to (a) (having ceria deposited in the pores) would render obvious the use of such a fuel (hydrogen fuel with a 50 ppm sulfur impurity), since such a substitution of such a fuel would result in the predictable result of function as a fuel in a solid oxide fuel cell. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use a fuel with 50 ppm sulfur impurity, as Isenberg teaches hydrogen fuel, wherein a ceria doped anode would be sulfur tolerant up to at least 50 ppm, and thus the use of such a fuel in the structure rendered obvious by the combination of Cable '903 and Isenberg would render obvious using such a fuel, since it would have yielded in the predictable result of acting as a functioning fuel in a solid oxide fuel cell. (Note: 50 ppm of hydrogen sulfide is taken to be approximately 50 ppm sulfur, as the weight of the hydrogen portion in hydrogen sulfide is small and negligible.)

As to (c), Keegan teaches a list of possible fuels used in a solid oxide fuel cell system (col. 1, lines 62-64). These fuels include hydrogen (the same fuels embodied by Isenberg and Cable '903) as well as conventional higher hydrocarbon fuels, such as gasoline, diesel, ethanol, kerosene, natural gas, propane, butane, etc. (col. 2, lines 43-45 and 51-60). Accordingly, gasoline, diesel, ethanol, kerosene, natural gas, propane, and butane are all art recognized equivalents for hydrogen for their use as fuels in solid oxide fuel cells (wherein all are hydrocarbons with 2 or more carbons). Furthermore, it is particularly pointed out that the combination of the conventional hydrocarbon fuels

can also be combined with the simpler fuels (such as hydrogen) (col. 2, lines 44-65). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use diesel, kerosene, gasoline, ethanol, or natural gas or combinations of the aforementioned with hydrogen as fuel (instead of hydrogen), since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Furthermore, the replacement of art recognized equivalents with one another would result in the predictable result of acting in the same manner (acting as fuel).

As to (d), Cable '285 teaches doping an anode with sulfur-resistance ceria, wherein an electronically conducting phase, such as copper, is added (col. 10, lines 17-31). The motivation for wanting to include copper in the ceria dopant (which would then impregnate the anode) would be to increase the electronic conductivity throughout the fuel cell and thus improve performance. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to add electronically conductive copper to ceria (as taught by Cable '285.), wherein the ceria mixture is used to impregnate the anode for sulfur tolerance (as taught by Isenberg) in order to facilitate electronic conductivity and improve fuel cell operation.

(Note: Although claim 64 includes the claim language that a copper salt is used to deposit copper into the pores of the anode, this is product by process limitation, wherein the product of the combination of Cable '903, Isenberg, and Cable'285 would teach of copper in the pores of the anode, thus being the same as the claimed invention.

Process limitations are not given weight with regards to the product as long as the product is the same of that of the claimed invention.

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

"The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature" than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.)

It is noted that the fuel cells within the system of using such a defined system are inherently capable of operating directly with a sulfur-containing hydrocarbon fuel without undergoing treatment to remove sulfur compounds, as such systems are the same as that claimed, barring a showing to the contrary.

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson*, 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In *re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In *re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In *re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

**(10) Response to Argument**

**Issue A – Appellant summarizes the arguments ((1) the rejections are based upon references that teach away from combination from one another; (2) the rejections are based upon references that teach away from the claimed invention; (3) the rejections are based upon the Examiner's misreading of one of the references, and (4) the proposed reference combination fails to address every limitation of Appellants' claims).**

Examiner respectfully disagrees and submits that the references are combinable in such a way that is applicable to Appellant's claims. It is noted that such arguments are answered in full in Issue C, wherein subsections within fully articulate Appellant's arguments.

**Issue B – Appellant makes a statement that the Board must determine whether or not a *prima facie* case of unpatentability has been established.**

It is noted that Examiner agrees with such a statement and submits that such a *prima facie* case of unpatentability has been met by the rejection set forth above. Again, it is noted that Appellant's arguments are answered in full in the appropriate subsections of Issue C below.

**Issue C – Appellant argues that Examiner has made improper reference combinations and has failed to address every limitation of the claimed invention and thus has not met the *prima facie* case of obviousness.**

Examiner respectfully disagrees and submits that such a *prima facie* case of unpatentability has been met by the rejection set forth above. At this point, it is noted

that Appellant only makes conclusory statements without providing any particular argument, proof, or reasoning as to how the references are not combinable and do not encompass the claim limitations. Again, it is noted that Appellant's arguments are answered in full in the appropriate subsections of Issue C below.

**Issue C-1 – Appellant merely reiterates what must be set forth to establish obviousness.**

Examiner submits that a *prima facie* case of unpatentability has been met by the rejection set forth above. For non-limiting example, the reason as to why it would be obvious to combine Cable '903 and Isenberg is reiterated below in order to clarify how Examiner has met the conditions of setting for a *prima facie* case of obviousness.

"Cable '903 does not teach of (a) having ceria deposited in the pores of the anode...

As to (a), Isenberg teaches that the fuel electrode (anode) is porous and is impregnated with cerium nitrate, which results in a porous fuel electrode with ceria ((CeO<sub>2</sub>)<sub>0.8</sub>(La<sub>2</sub>O)<sub>0.2</sub>) impregnated in the porous electrode (col. 6, lines 12-43). The motivation for using ceria based outer coatings (made by such impregnation, resulting in ceria in the pores) is that ceria doping results in proved sulfur tolerance (col. 1, lines 55-68; col. 2, lines 1-27, 54-56; col. 5, lines 3-9; col. 7, lines 1-20 fig. 6). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to impregnate the fuel electrode of Cable '903 et al. with ceria (which results with ceria in the pores of the anode) in order to improve sulfur tolerance within the fuel cell."



Accordingly, it is submitted that a teaching as well as motivation for combining has been set forth, and thus the conditions for establishing obviousness has been met. Again, at this point, Appellant has not provided any argument, proof, or reasoning as to how the references do not encompass the claim limitations. Again, it is noted that Appellant's arguments are answered in full in the appropriate subsections of Issue C below.

**Issue C-2-a - Appellant submits that the arguments presented are directed towards the rejections of the independent claims 62, 63, and 64, wherein all other rejections will stand or fall based on the resolution of the independent claims.**

Such a statement is noted, and all responses will be directed towards the independent claims.

**Issue C-2-a-i – (a) Appellant argues that US 4582776 and US 4812329 (both by Isenberg), which are relied upon by the Examiner are criticized by Cable '903 (citing col. 1, lines 29-43, wherein Cable '903 mentions Isenberg '766, wherein the electrolyte/electrode binding causes thermal expansion mismatch) and Cable '205 (citing col. 2, lines 14-45 of Cable '285, mentions Isenberg '329, which also talks about cracking and poisoning of the anode due to thermal cycling) and thus are not combinable, (b) points out that the Cable references use a microslip zone between the electrodes and electrolytes, the electrode and electrolyte is not bonded (in the same manner criticized in the Isenberg patents) that the references are not combinable, and (c) states that Isenberg only operates with hydrogen and one-carbon fuels (not two or more carbons), pointing to the**

**declaration submitted January 26, 2009 to show that hydrogen/one-carbon fuels would behave differently than those with two or more carbons.**

Examiner respectfully disagrees.

With respect to (a):

It is first noted that US 4582776 (Isenberg '776) is *not* relied upon in the rejection. Accordingly, arguments with respect to Isenberg '776 are not applicable to the rejection of record, as it is irrelevant to argue the combining of two prior arts when one of them is not even relied upon. However, US 4812329 (referred to as Isenberg in the rejection above and as Isenberg '329 in the response to arguments, for clarity's sake, as Appellant makes several references to Isenberg '776, the reference which is not relied upon in the rejection) is relied upon in the rejection and is discussed herein. Isenberg '329's "binding" is described in a very particular manner, in such a manner that binding material [12] (electrolyte material) is used within the anode to create the bound anode (electrode [6]) /electrolyte [5] interface (fig. 3; col. 4, lines 7-10). In Isenberg '329 oxide binder [12] is seen to connect a conductor [11] and metal oxide conductive coating [15] to the electrolyte [5], wherein both the binder [12] and the conductor [11] are in contact with the electrolyte (fig. 3; col. 4, lines 45-60). It is noted that Isenberg '776 (not relied upon in the rejection) has a different structure than Isenberg '329, as only the ceramic coating [3] (of the electrode) is in contact with the electrolyte [2] (see figs. 1-3 in Isenberg '776). Accordingly, the two bindings in Isenberg '776 and Isenberg '329 are materially different and cannot necessarily be compared.

In such a manner, it is noted that just because Cable '903 criticizes Isenberg '776 (reference not relied upon in the rejection), does not mean that Cable '903 cannot be combined with Isenberg '329 (reference relied upon in the rejection), as Cable '903 does not particularly criticize Isenberg '329, wherein the structures of Isenberg '329 and Isenberg '776 are not the same. Accordingly, such arguments directed at the combination of Cable '903 and Isenberg '329 (relied upon in the rejection) are not directed to the rejection made and are thus irrelevant.

Furthermore, even if Isenberg '329 and Isenberg '776 are compared to Cable '903, just because the anode/electrolyte interface is different does not constitute a teaching away, due to the fact that (1) such an argument is irrelevant and (2) Cable '903 does not constitute a teaching away from Isenberg '329. Reasons as to these positions are set forth below.

(1) Appellant's argument is irrelevant:

Comparing Isenberg '329 with Cable '903:

It is once again emphasized that Cable '903 does not mention Isenberg '329, and thus cannot be seen to teach away from the combination of with Isenberg '329. Furthermore, it is noted that within the current rejection, Isenberg '329 is only being relied upon to provide ceria into the pores for sulfur tolerance purposes. Accordingly, the combination is with respect to the sulfur tolerance, and not direct towards the anode/electrolyte interface. Furthermore, it is noted that the inclusion of ceria in an electrode, regardless of the anode/electrolyte of interface, would provide the same predictable affect to the electrode - sulfur

tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teaching within Isenberg, with respect to ceria improving sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristic of improved sulfur tolerance would be expected. Appellant has not given any proof or reasoning as to how the electrolyte/anode interface would affect the characteristic of ceria for sulfur tolerance or how the results of this combination would yield any unexpected results.

Comparing Isenberg '776 with Cable '903:

Again it is emphasized Isenberg '776 is *not* relied upon in the rejection; however, the portion wherein Cable '903 criticizes Isenberg '776 is examined. The binding of Isenberg '776 that Cable '903 criticizes is with respect to a ceramic coating binding the electrolyte to metal particles, wherein the thermal expansion mismatch is drawn to the difference between ceramic and metal (col. 2, lines 30-43). However, it is noted that electronically conducting particles are only optional in Cable '903 (i.e. are not necessarily present within the anode) (col. 5, lines 23-36). Accordingly, bonding between the electronic conductors (metals) and electrolyte (a ceramic material) is not necessarily present. Accordingly, the condition which Cable '903 is criticizing (about Isenberg '776) may not even exist. Accordingly, arguments as to the fact that Cable '903 criticizes the metal/ceramic expansion differences (within the electrode and electrolyte, respectively) is not germane to the rejection of record, as metal expansion may not problem within Cable '903 (as its inclusion is not necessary).

Accordingly, the argument is not seen to be relevant to the rejection, and is unconvincing.

(2) Cable '903 does not teach away from Isenberg '329/'776:

Comparing Isenberg '329 with Cable '903:

It is once again emphasized that Cable '903 does not mention Isenberg '329, and thus cannot be seen to teach away from the combination of with Isenberg '329.

Comparing Isenberg '776 with Cable '903:

Again it is emphasized Isenberg '776 is *not* relied upon in the rejection. Even so, the portion wherein Isenberg '776's interface is being criticized can be taken into consideration. Although Cable '903 may teach that there may be disadvantages to the bonding particular to Isenberg '776 (ceramic-metal interface), this does not specifically constitute a teaching away. It does not negate the fact that Cable '903 teaches an example wherein the anode material is coated directly to the surface of the electrolyte (col. 5, lines 5-22). Fig. 1, which is embodied by Cable'903, shows direct contact between the anode and the electrolyte as well. It is noted that such a contact constitutes a bonding of some sort. For example, the pressure of the unit cell stack would bond the two and as to prevent reactant leakage. Furthermore, at the very least, the direct contact at least constitutes an electrically bound anode and electrolyte (as if this is not the case, no power would be able to be generated from the fuel cell). Office personnel are to give claims their broadest reasonable interpretation in

light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Also, limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Zletz*, 893F.2d 319, 321-22, 13 USPQ2d, 1320, 1322 (Fed. Cir. 1989). Accordingly, as Appellant does not clearly specify the type of bonding claimed such interpretations are applicable and read on the claim language.

Furthermore, although a microslip layer may be preferred in Cable '903, its disclosure on a whole clearly shows that they recognize that a fuel cell without such a layer would still be known to work to one of ordinary skill in the art (as seen in fig. 1 an exemplified in col. 5, lines 5-9). Accordingly, consideration of the entire reference of Cable '903 would include a teaching of a directly bonded anode/electrolyte. Additionally, Examiner would like to submit that Cable '903 (even with the microslip layer) is not teaching that anode material is not being bonded directly to the electrolyte. The microslip material itself is just anode material, wherein it is embodied that the electrode is made up of the microslip layer (for example [17] on the anode side) with the bulk electrode (for example [4] anode), wherein this is a continuous layer with a porosity gradient within the anode material (col. 6, lines 1-26). Accordingly, in this manner, it is seen that Cable '903 is merely teaching a porosity gradient through the electrode active material, and in such a manner, it does not constitute a teaching away of having anode material bonded to the electrolyte. Again, it is emphasized that the term "bound" is broader than Appellant is reading it to be (and that just because Cable

'903 does not teaching of the same type of bonding as Isenberg '329/'776, does not mean that it is not bound in some manner).

It is noted that Appellant also makes similar arguments concerning the combination of Cable '285 and the Isenberg references (criticizes electrode/electrolyte bonding and thus teaches away from combining). (It is noted that only Isenberg '329 is compared to Cable '285 (for sake for responding to the arguments), as Cable mentions Isenberg '329 and Isenberg '776, wherein the latter is not relied upon in the rejection.) First it is noted that such an argument (with respect to the combination of Cable '285 and Isenberg '329) is not applicable to independent claims 62 and 63, as Cable '285 is not relied upon in the rejection for claims 62 and 63. However, since claim 64 relies on Cable '285, such a response to the arguments is set forth as applicable to only claim 64.

It is noted that the arguments directed towards the combination of Cable '285 and Isenberg '329 are irrelevant to the rejection at hand. First, within the current rejection, Isenberg '329 is only being relied upon to provide ceria into the pores for sulfur tolerance purposes. Second, Cable '903 (not Cable '285) is relied upon as the primary reference, wherein it has clearly been set forth above why Cable '903 is still combinable with Isenberg '329 (for non-limiting example, the fact that Cable '903 never mentions Isenberg '329; see above for full details). Accordingly, such an arguments with respect to Isenberg '329 combined with Cable '285 are irrelevant.

Furthermore, just because the interfaces taught by Cable '285 and Isenberg '329 are different does not mean that they are not combinable. Cable's criticism of the metal/electrolyte interface is due thermal expansion mismatch (col. 1, lines 55-66).

However, the portion relied upon in Cable '285 has to do with sulfur tolerance, as is the portion that is relied upon in Isenberg '329. Accordingly, both are used for the same reason (sulfur tolerance), and accordingly can be combined with respect to such teaching. Accordingly, although the electrolyte/anode interface is different in Isenberg '329 and Cable '285, both pieces deal with sulfur tolerance. Since both similarly deal with sulfur tolerance, the reliance on both teachings with respect to sulfur tolerance is combinable on this front, as sulfur tolerance is what the references' principle of operation is centered around. Furthermore, it is noted that although Cable '285 does criticize Isenberg '329, within such portion set forth by Appellant, Cable '285 does recognize itself that cerium oxide (ceria) does help reduce cell degradation (col. 2, lines 40-45). Accordingly, although the anode/electrolyte interface of Isenberg '329 is criticized, Cable '285 specifically recognizes that cerium oxide keeps a solid oxide fuel cell from degrading, and thus the inclusion would be obvious, as Cable '285 specifically recognizes the use of ceria to prevent performance degradation. Again it is emphasized that the both teachings drawn from Cable '285 and Isenberg '329 deal with sulfur tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teachings with respect to sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristics of improved sulfur tolerance would be expected, as the teachings are drawn to the same characteristic (regardless as to the anode/electrolyte interface). Appellant has not given any proof or reasoning as to how the electrolyte/anode interface would affect the characteristics of sulfur tolerance or how the results of the combination set forth would yield any unexpected results.



Accordingly, the arguments are seen to be irrelevant, as they do not address the rejection as set forth, and are thus not convincing.

With respect to (b):

It is noted that Cable '903 is relied upon as the primary reference, and thus such an argument with respect to Cable '285 is not applicable (as it is being relied upon with respect to the use of copper). Furthermore, as set forth above and reiterated herein, Appellant is applying too narrow of a definition to "bound." It is noted that fig. 1 of Cable '903 shows the anode [4] next to the electrolyte [6], wherein such a contact constitutes a bonding of some sort. For example, the pressure of the unit cell stack would bond the two and as to prevent reactant leakage. Furthermore, at the very least, the direct contact at least constitutes an electrically bound anode and electrolyte (as if this is not the case, no power would be able to be generated from the fuel cell). Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Also, limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Zletz*, 893F.2d 319, 321-22, 13 USPQ2d, 1320, 1322 (Fed. Cir. 1989). Accordingly, as Appellant does not clearly specify the type of bonding claimed such interpretations are applicable and read on the claim language. Additionally, as microslip layer is embodied to be made of anode material and is embodied to be continuous with the bulk anode, and thus is bonded with the electrolyte in some manner (barring specification as to the bonding) (col. 6, lines 1-26). Again it is emphasized that such arguments are not germane to the rejection of record, as they fail

to discuss sulfur tolerance and fail to show any proof as to how the anode/electrolyte interface would affect the addition of ceria. Additionally, it is submitted that Cable '903 does not teach away from bonding the anode material and the electrolyte; it is only seen to teach of an improved anode/electrolyte interface, wherein a porosity gradient of the anode would improve the system mechanically.

With respect to (c):

Isenberg is not being relied upon to teach of using fuels with two carbons or more. Keegan is relied upon to render obvious possible fuels used in a solid oxide fuel cell system (col. 1, lines 62-64). These fuels include hydrogen (the same fuels embodied by Isenberg and Cable '903) as well as conventional higher hydrocarbon fuels, such as gasoline, diesel, ethanol, kerosene, natural gas, propane, butane, etc. (col. 2, lines 43-45 and 51-60). Accordingly, in such a manner, Appellant is merely addressing the references separately in, rather than the combination, as set forth in the rejection. In response to Appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

**NOTE:** Examiner would like to take the opportunity at this time to fully address the submitted **affidavit** and the reasons as to why it is not persuasive below.

The affidavit under 37 CFR 1.132 filed February 26, 2009 is insufficient to overcome the rejection of the claims based upon the combination of Cable '903,

Isenberg, and Keegan (with respect to using a two-carbon or larger hydrocarbon, C<sub>2</sub>+ hydrocarbon, in a solid oxide fuel cell) as set forth in the last Office action because:

(a) Declarant submits that the invention of the instant application achieves unexpectedly superior results to the alternative devices in the field (section 6 of the affidavit).

Examiner respectfully disagrees and submits that Declarant has not provided any proof showing such unexpected result. Accordingly, such a submission is not seen to be convincing, as no positive proof has been established with respect to this statement.

(b) Declarant states that the Office would find it obvious over Cable '903 and Isenberg to use fuels having C<sub>2</sub>+hydrocarbon fuel and having a sulfur content from about 1-5000 ppm, and submits that higher hydrocarbons behave differently than other fuels (methane, CO, and hydrogen) (sections 7 and 8 of the affidavit).

Examiner respectfully disagrees with Declarant's extrapolation. Although Isenberg is relied upon to provide a fuel with the claimed sulfur content, Keegan is also relied upon to show that hydrogen and C<sub>2</sub>+hydrocarbons are both known fuels for the use in solid oxide fuel cells (col. 2, lines 43-65). Additionally, although Declarant states that C<sub>2</sub>+hydrocarbon fuels would behave differently than fuels like CO, H<sub>2</sub>, and methane, there is proof or showing as to this fact. More importantly, Declarant has not provided any showing as to the fact that

C2+hydrocarbon fuels cannot be used as fuel in solid oxide fuel cells (which is what Keegan renders obvious). Accordingly, the affidavit is not found to be convincing.

(c) Declarant submits that nickel-based fuel cells may operate on CH<sub>4</sub> or H<sub>2</sub>, but higher hydrocarbon fuels would leave deposits, wherein one of ordinary skill in the art would want to avoid (and would not have used the devices of Cable or Isenberg in conjunction with C2+hydrocarbon fuels) (section 9 of the affidavit).

Examiner respectfully disagrees with Declarant's position, as Cable '903 either teaches or renders obvious an anode without nickel (using copper instead) (see the rejection above). Accordingly, the statement in the affidavit is not applicable to Cable '903. It is noted that such an argument is irrelevant as applied to Isenberg, as Isenberg is not being relied upon to teach of a nickel-free device. It is again emphasized that Cable '903 either teaches or renders obvious an anode without nickel (see the rejection). Accordingly, it is irrelevant that Isenberg has nickel in it, as the combination (of Cable '903, Isenberg, and Keegan) set forth has a nickel-free device. In such a manner, Appellant is merely addressing the references separately in, rather than the combination, as set forth in the rejection. In response to Appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Furthermore,

Declarant has not provided any proof or showing why such assertions (with respect to the carbon deposits, or with respect the fact that one of ordinary skill in the art would have avoided using C+2 hydrocarbon fuels because of it) are necessarily true, and thus such assertions are seen to be mere conclusory statements. Additionally, no proof, reasoning, or showing has been provided as to the fact that such fuels would not operate in a fuel cell. Accordingly, the affidavit is not found to be convincing.

**Issue C-2-a-ii –Appellant again argues (this time specifically with respect to claim 62, and thus its dependents) that Examiner has made improper reference combinations and has failed to address every limitation of the claimed invention and thus has not met the *prima facie* case of obviousness.**

Examiner respectfully disagrees and submits that such a *prima facie* case of unpatentability has been met by the rejection set forth above. At this point, it is noted that Appellant has not provided any argument, proof, or reasoning as to how the rejection does not encompass the claim limitations. Furthermore, as set forth above, it is submitted that the references are combinable. Again, it is noted that Appellant's arguments are answered in full in the appropriate subsections of Issue C below.

**Issue C-2-a-ii-A – Appellant merely uses this section to recite the claim limitations.**

It is submitted that no arguments are provided within this section, and thus no response is provided.

**Issue C-2-a-ii-B – Appellant argues that Cable and Isenberg teach away from one another (citing col. 1, lines 29-43 of Cable '903, which mentions Isenberg '766, wherein the electrolyte/electrode binding causes thermal expansion mismatch and citing col. 2, lines 14-45 of Cable '285, mentions Isenberg '329, which also talks about cracking and poisoning of the anode due to thermal cycling), and thus are not combinable.**

It is first noted that US 4582776 (Isenberg '776) is *not* relied upon in the rejection. Accordingly, arguments with respect to Isenberg '776 are not applicable to the rejection of record, as it is irrelevant to argue the combining of two prior arts when one of them is not even relied upon. However, US 4812329 (referred to as Isenberg in the rejection above and as Isenberg '329 in the response to arguments, for clarity's sake, as Appellant makes several references to Isenberg '776, the reference which is not relied upon in the rejection) is relied upon in the rejection and is discussed herein. Isenberg '329's "binding" is described in a very particular manner, in such a manner that binding material [12] (electrolyte material) is used within the anode to create the bound anode (electrode [6]) /electrolyte [5] interface (fig. 3; col. 4, lines 7-10). In Isenberg '329 oxide binder [12] is seen to connect a conductor [11] and metal oxide conductive coating [15] to the electrolyte [5], wherein both the binder [12] and the conductor [11] are in contact with the electrolyte (fig. 3; col. 4, lines 45-60). It is noted that Isenberg '776 (not relied upon in the rejection) has a different structure than Isenberg '329, as only the ceramic coating [3] (of the electrode) is in contact with the electrolyte [2] (see figs. 1-3 in

Isenberg '776). Accordingly, the two bindings in Isenberg '776 and Isenberg '329 are materially different and cannot necessarily be compared.

In such a manner, it is noted that just because Cable '903 criticizes Isenberg '776 (reference not relied upon in the rejection), does not mean that Cable '903 cannot be combined with Isenberg '329 (reference relied upon in the rejection), as Cable '903 does not particularly criticize Isenberg '329, wherein the structures of Isenberg '329 and Isenberg '776 are not the same. Accordingly, such arguments directed at the combination of Cable '903 and Isenberg '329 (relied upon in the rejection) are not directed to the rejection made and are thus irrelevant.

Furthermore, even if Isenberg '329 and Isenberg '776 are compared to Cable '903, just because the anode/electrolyte interface is different does not constitute a teaching away, due to the fact that (1) such an argument is irrelevant and (2) Cable '903 does not constitute a teaching away from Isenberg '329. Reasons as to these positions are set forth below.

(1) Appellant's argument is irrelevant:

Comparing Isenberg '329 with Cable '903:

It is once again emphasized that Cable '903 does not mention Isenberg '329, and thus cannot be seen to teach away from the combination of with Isenberg '329. Furthermore, it is noted that within the current rejection, Isenberg '329 is only being relied upon to provide ceria into the pores for sulfur tolerance purposes. Accordingly, the combination is with respect to the sulfur tolerance, and not directed towards the anode/electrolyte interface. Furthermore, it is noted

that the inclusion of ceria in an electrode, regardless of the anode/electrolyte of interface, would provide the same predictable affect to the electrode - sulfur tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teaching within Isenberg, with respect to ceria improving sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristic of improved sulfur tolerance would be expected. Appellant has not given any proof or reasoning as to how the electrolyte/anode interface would affect the characteristic of ceria for sulfur tolerance or how the results of this combination would yield any unexpected results.

Comparing Isenberg '776 with Cable '903:

Again it is emphasized Isenberg '776 is *not* relied upon in the rejection; however, the portion wherein Cable '903 criticizes Isenberg '776 is examined. The binding of Isenberg '776 that Cable '903 criticizes is with respect to a ceramic coating binding the electrolyte to metal particles, wherein the thermal expansion mismatch is drawn to the difference between ceramic and metal (col. 2, lines 30-43). However, it is noted that electronically conducting particles are only optional in Cable '903 (i.e. are not necessarily present within the anode) (col. 5, lines 23-36). Accordingly, bonding between the electronic conductors (metals) and electrolyte (a ceramic material) is not necessarily present. Accordingly, the condition which Cable '903 is criticizing (about Isenberg '776) may not even exist. Accordingly, arguments as to the fact that Cable '903 criticizes the metal/ceramic expansion differences (within the electrode and



electrolyte, respectively) is not germane to the rejection of record, as metal expansion may not problem within Cable '903 (as its inclusion is not necessary). Accordingly, the argument is not seen to be relevant to the rejection, and is unconvincing.

(2) Cable '903 does not teach away from Isenberg '329/'776:

Comparing Isenberg '329 with Cable '903:

It is once again emphasized that Cable '903 does not mention Isenberg '329, and thus cannot be seen to teach away from the combination of with Isenberg '329.

Comparing Isenberg '776 with Cable '903:

Again it is emphasized Isenberg '776 is *not* relied upon in the rejection. Even so, the portion wherein Isenberg '776's interface is being criticized can be taken into consideration. Although Cable '903 may teach that there may be disadvantages to the bonding particular to Isenberg '776 (ceramic-metal interface), this does not specifically constitute a teaching away. It does not negate the fact that Cable '903 teaches an example wherein the anode material is coated directly to the surface of the electrolyte (col. 5, lines 5-22). Fig. 1, which is embodied by Cable'903, shows direct contact between the anode and the electrolyte as well. It is noted that such a contact constitutes a bonding of some sort. For example, the pressure of the unit cell stack would bond the two and as to prevent reactant leakage. Furthermore, at the very least, the direct contact at least constitutes an electrically bound anode and electrolyte (as if this

is not the case, no power would be able to be generated from the fuel cell). Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Also, limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Zletz*, 893F.2d 319, 321-22, 13 USPQ2d, 1320, 1322 (Fed. Cir. 1989). Accordingly, as Appellant does not clearly specify the type of bonding claimed such interpretations are applicable and read on the claim language.

Furthermore, although a microslip layer may be preferred in Cable '903, its disclosure on a whole clearly shows that they recognize that a fuel cell without such a layer would still be known to work to one of ordinary skill in the art (as seen in fig. 1 an exemplified in col. 5, lines 5-9). Accordingly, consideration of the entire reference of Cable '903 would include a teaching of a directly bonded anode/electrolyte. Additionally, Examiner would like to submit that Cable '903 (even with the microslip layer) is not teaching that anode material is not being bonded directly to the electrolyte. The microslip material itself is just anode material, wherein it is embodied that the electrode is made up of the microslip layer (for example [17] on the anode side) with the bulk electrode (for example [4] anode), wherein this is a continuous layer with a porosity gradient within the anode material (col. 6, lines 1-26). Accordingly, in this manner, it is seen that Cable '903 is merely teaching a porosity gradient through the electrode active material, and in such a manner, it does not constitute a teaching away of having

anode material bonded to the electrolyte. Again, it is emphasized that the term "bound" is broader than Appellant is reading it to be (and that just because Cable '903 does not teaching of the same type of bonding as Isenberg '329/'776, does not mean that it is not bound in some manner).

It is noted that Appellant also makes similar arguments concerning the combination of Cable '285 and the Isenberg references (criticizes electrode/electrolyte bonding and thus teaches away from combining). (It is noted that only Isenberg '329 is compared to Cable '285 (for sake for responding to the arguments), as Cable mentions Isenberg '329 and Isenberg '776, wherein the latter is not relied upon in the rejection.) First it is noted that such an argument (with respect to the combination of Cable '285 and Isenberg '329) is not applicable to independent claims 62 and 63, as Cable '285 is not relied upon in the rejection for claims 62 and 63. However, since claim 64 relies on Cable '285, such a response to the arguments is set forth as applicable to only claim 64.

It is noted that the arguments directed towards the combination of Cable '285 and Isenberg '329 are irrelevant to the rejection at hand. First, within the current rejection, Isenberg '329 is only being relied upon to provide ceria into the pores for sulfur tolerance purposes. Second, Cable '903 (not Cable '285) is relied upon as the primary reference, wherein it has clearly been set forth above why Cable '903 is still combinable with Isenberg '329 (for non-limiting example, the fact that Cable '903 never mentions Isenberg '329; see above for full details). Accordingly, such an arguments with respect to Isenberg '329 combined with Cable '285 are irrelevant.

Furthermore, just because the interfaces taught by Cable '285 and Isenberg '329 are different does not mean that they are not combinable. Cable's criticism of the metal/electrolyte interface is due thermal expansion mismatch (col. 1, lines 55-66). However, the portion relied upon in Cable '285 has to do with sulfur tolerance, as is the portion that is relied upon in Isenberg '329. Accordingly, both are used for the same reason (sulfur tolerance), and accordingly can be combined with respect to such teaching. Accordingly, although the electrolyte/anode interface is different in Isenberg '329 and Cable '285, both pieces deal with sulfur tolerance. Since both similarly deal with sulfur tolerance, the reliance on both teachings with respect to sulfur tolerance is combinable on this front, as sulfur tolerance is what the references' principle of operation is centered around. Furthermore, it is noted that although Cable '285 does criticize Isenberg '329, within such portion set forth by Appellant, Cable '285 does recognize itself that cerium oxide (ceria) does help reduce cell degradation (col. 2, lines 40-45). Accordingly, although the anode/electrolyte interface of Isenberg '329 is criticized, Cable '285 specifically recognizes that cerium oxide keeps a solid oxide fuel cell from degrading, and thus the inclusion would be obvious, as Cable '285 specifically recognizes the use of ceria to prevent performance degradation. Again it is emphasized that the both teachings drawn from Cable '285 and Isenberg '329 deal with sulfur tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teachings with respect to sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristics of improved sulfur tolerance would be expected, as the teachings are drawn to the same characteristic (regardless as to the

anode/electrolyte interface). Appellant has not given any proof or reasoning as to how the electrolyte/anode interface would affect the characteristics of sulfur tolerance or how the results of the combination set forth would yield any unexpected results. Accordingly, the arguments are seen to be irrelevant, as they do not address the rejection as set forth, and are thus not convincing.

**Issue C-2-a-ii-C – Appellant argues that Cable criticizes bonding of an anode and electrolyte \*as it advocates “microslip zones” (Cable ‘903, col. 2, lines 46-52) between the electrolyte and electrode components) and cannot render the claimed invention obvious.**

Examiner respectfully disagrees. It is noted that Cable ‘903’s disclosure does teach of a directly bonded anode and electrolyte (fig. 1), wherein the preference for a microslip layer does not negate the clear teaching. Additionally, Cable ‘903’s microslip layer [17] is embodied to be anode material, wherein it is made in a continuous layer with the bulk anode [4], thus creating a composite anode (col. 6, lines 1-26). Accordingly Cable ‘903 is merely teaching that a porosity gradient of the anode would improve the mechanical aspects of the invention and thus does not teach away from bonding the anode material and the electrolyte. It is only seen to teach of an improved anode via porosity gradient. Again it is emphasized that Cable ‘903 specifically exemplifies an anode [4] placed next to an electrolyte [6] (fig. 1), which constitutes bonding by direct contact within a cell configuration. Furthermore, the microslip layer itself is embodied to be anode material (only with a different porosity) (col. 6, lines 6-26; fig. 2), so in such a manner, as it is still made out of anode material, the anode can be

interpreted to be bound to the anode by direct contact of anode material and electrolyte material. Furthermore, it is submitted that Appellant is applying too narrow of a definition to the term "bound." For example, the pressure of the unit cell stack would result in bound layers as to prevent reactant leakage (wherein fig. 1 shows anode next to the electrolyte). Furthermore, at the very least, the direct contact at least constitutes an electrically bound anode and electrolyte (as if this is not the case, no power would be able to be generated from the fuel cell). Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Also, limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Zletz*, 893F.2d 319, 321-22, 13 USPQ2d, 1320, 1322 (Fed. Cir. 1989). Accordingly, as Appellant does not clearly specify the type of bonding claimed such interpretations are applicable and read on the claim language. Additionally, as microslip layer is embodied to be made of anode material and is embodied to be continuous with the bulk anode, and thus is bonded with the electrolyte in some manner (barring specification as to the bonding) (col. 6, lines 1-26). Again, it is emphasized that the only bonding criticized is the type of bonding that results in ceramic-metal bonding (col. 2, lines 30-43, as referring to Isenberg '776, which is not relied upon for the rejection), wherein the bonding Cable '903 is a different type of bonding, but still constitutes a bonding of some sort (barring specification as to the bonding) (col. 6, lines 1-26). Again it is emphasized that such arguments are not germane to the rejection of record, as they fail to discuss sulfur tolerance and fail to show any proof as to how the anode/electrolyte

interface would affect the addition of ceria. Additionally, it is submitted that Cable '903 does not teach away from bonding the anode material and the electrolyte; it is only seen to teach of an improved anode/electrolyte interface, wherein a porosity gradient of the anode would improve the system mechanically.

**Issue C-2-a-ii-D – Appellant argues that fig. 1 of Cable '903 only shows direct contact between an anode and an electrolyte, wherein such a relationship does not necessarily constitute a bonding between the two, especially in light of the fact Cable '903 wants to avoid bonding (col. 2, lines 38-41).**

Examiner respectfully disagrees with Appellant's position. It is submitted that Appellant is reading the term "bound" too narrowly. It is emphasized that the only bonding criticized is the type of bonding that results in ceramic-metal bonding (col. 2, lines 30-43, as referring to Isenberg '776, which is not relied upon for the rejection). Cable '903's anode/electrolyte interface and thus bonding is different (see fig. 1). Although it is different, it does not mean that it is not in some way bound. It is uncertain how two things placed in physical contact with one another are not bound in some manner. For example, the anode and electrolyte are bound to one another via pressure by the other elements of the stack (that sandwich the two pieces). If such a binding (via contact) did not occur, the fuel cell system would leak reactants. Furthermore, at the very least, the direct contact at least constitutes an electrically bound anode and electrolyte (as if this is not the case, no power would be able to be generated from the fuel cell). Accordingly, it is not clear how binding of some sort does not exist. Again it is

emphasized that Cable '903 specifically exemplifies an anode [3] placed next to an electrolyte [6] (fig. 1), which constitutes bonding by direct contact within a cell configuration. Such an interpretation can be taken barring specification as to what constitutes "bound." Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Also, limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Zletz*, 893F.2d 319, 321-22, 13 USPQ2d, 1320, 1322 (Fed. Cir. 1989). Accordingly, it is submitted that Appellant is applying too narrow of a definition to the term "bound," wherein Examiner submits that Cable '903 does provided a bound interface of some sort (as set forth above).

**Issue C-2-a-ii-E – Appellant argues that there is no reason to combine (to address sulfur tolerance) as (a) Examiner does not explain why one of ordinary skill would disregard a teaching away (with respect to bonded electrodes) that hindsight is being used.**

Examiner respectfully disagrees. First it is again emphasized Isenberg '776 (which is what Cable '903 mentions in its background art) is *not* relied upon in the rejection. Accordingly, arguments with respect to Isenberg '776 are not applicable to the rejection of record, as it is irrelevant to argue the combining of two prior arts when one of them is not even relied upon.

Additionally, in response to Appellant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that



any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the Appellant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). It is submitted that within the rejection, the teachings and what is the skill of the ordinary artisan is set forth. Particularly: "Isenberg [329] teaches that the fuel electrode (anode) is porous and is impregnated with cerium nitrate, which results in a porous fuel electrode with ceria ((CeO<sub>2</sub>)<sub>0.8</sub>(La<sub>2</sub>O)<sub>0.2</sub>) impregnated in the porous electrode (col. 6, lines 12-43). The motivation for using ceria based outer coatings (made by such impregnation, resulting in ceria in the pores) is that ceria doping results in proved sulfur tolerance (col. 1, lines 55-68; col. 2, lines 1-27, 54-56; col. 5, lines 3-9; col. 7, lines 1-20 fig. 6). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to impregnate the fuel electrode of Cable '903 et al. with ceria (which results with ceria in the pores of the anode) in order to improve sulfur tolerance within the fuel cell."

Accordingly, a reason to combine (based on sulfur-tolerance) is set forth, wherein one of ordinary skill in the art would have found it obvious to combine in order to provide such sulfur tolerance. Furthermore, it is emphasized that the inclusion of ceria in an electrode, regardless of the anode/electrolyte interface, would provide the same effect to the electrode - sulfur tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teaching within Isenberg, with respect to ceria

improving sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristic of improved sulfur tolerance would be expected. Appellant has not given any proof or reasoning as to how the electrolyte/anode interface would affect the characteristic of ceria for sulfur tolerance or how the results of this combination would yield any unexpected results. Additionally, it is noted that electronically conducting particles are only optional in Cable '903 (i.e. are not necessarily present within the anode) (col. 5, lines 23-36). Accordingly, there is not necessarily bonding between the electronic conductors (metals) and electrolyte, which is what Cable '903 is criticizing in col. 2, lines 30-43. Accordingly, the condition which Cable '903 is criticizing (about Isenberg '776, not relied upon) may not even exist. Accordingly, arguments as to the fact that Cable '903 criticizes the metal/ceramic expansion differences (within the electrode and electrolyte, respectively) is not germane to the rejection of record, as metal expansion may not problem within Cable '903 (as its inclusion is not necessary). Accordingly, the argument is not seen to be relevant to the rejection, and is unconvincing. Accordingly, it is submitted that Appellant is not considering the teaching as a whole, as Appellant has not addressed why one of ordinary skill would not want to improve sulfur tolerance within fuel cell use, has not supplied any reasoning/proof/evidence, as to how ceria would not provide this to a fuel cell electrode (regardless of the electrode/electrolyte interface), and has not taken into consideration of the teaching of Cable '903 as a whole, which has an embodiment that would not have the thermal mismatch problem (due to the lack of inclusion of a metal conductive particle).

In such a manner, Examiner submits that Appellant is not looking at the reference (Isenberg '329) as a whole (focusing only to the slightly inferior anode/electrolyte interface, as set forth in Cable '285 not specifically mentioned in Cable '903, without considering its teaching with respect to sulfur tolerance). It is noted that a "prior art reference that "teaches away" from the claimed invention is a significant factor to be considered in determining obviousness; however, "the nature of the teaching is highly relevant and must be weighed in substance. A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *In re Gurley*, 27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)"; see MPEP §2145(x)(D)(1). Accordingly, Appellant is not considering the nature of the case as a whole by not considering the whole teaching.

Lastly, it is noted that Cable '285 (a secondary reference that does recognize Isenberg '329 by name) does recognize itself that cerium oxide (ceria) does help reduce degradation even while criticizing Isenberg '329 (col. 2, lines 40-45). Accordingly, although the anode/electrolyte interface of Isenberg is criticized, Cable '285 specifically recognizes that cerium oxide keeps a solid oxide fuel cell from degrading, and thus the inclusion would be obvious, as Cable '285 specifically recognizes the use of ceria to prevent performance degradation.

**Issue C-2-a-ii-F – Appellant argues the use of Keegan fails to address the limitations of the pending claims, specifically that the device is “capable of**

**directly operating with a sulfur-containing hydrocarbon fuel that does not undergo prior treatment,” since Keegan uses a reformer.**

Examiner respectfully disagrees. It is noted that Keegan is relied upon to render obvious possible fuels used in a solid oxide fuel cell system (col. 1, lines 62-64). These fuels include hydrogen (the same fuels embodied by Isenberg and Cable '903) as well as conventional higher hydrocarbon fuels, such as gasoline, diesel, ethanol, kerosene, natural gas, propane, butane, etc. (col. 2, lines 43-45 and 51-60). Accordingly, gasoline, diesel, ethanol, kerosene, natural gas, propane, and butane are all art recognized equivalents for hydrogen for their use as fuels in solid oxide fuel cells (wherein all are hydrocarbons with 2 or more carbons). Furthermore, it is particularly pointed out that the combination of the conventional hydrocarbon fuels can also be combined with the simpler fuels (such as hydrogen) (col. 2, lines 44-65). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use diesel, kerosene, gasoline, ethanol, or natural gas or combinations of the aforementioned with hydrogen as fuel (instead of hydrogen), since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. Furthermore, the replacement of art recognized equivalents with one another would result in the predictable result of acting in the same manner (acting as fuel).

In such a manner, Appellant is mischaracterizing the rejection, as Keegan is not being relied upon to teach that the fuel does not undergo prior treatment. However,

Examiner that such a limitation is not being claimed; Appellant is reading the claim language too narrowly. The claim language only states that the fuel cell system is "capable" of using such fuels that do not undergo prior treatment, not that the fuel used does not undergo prior treatment. The fuel cells within the systems/processes of using such defined systems (as obviated with the rejection) are inherently "capable" of operating directly with a sulfur-containing hydrocarbon fuel without undergoing treatment to remove sulfur compounds, as such systems/methods of operating are the same as that claimed, barring a showing to the contrary. Accordingly, they would have the same capabilities. It again is emphasized that *none* of the pending claims specifically *require* the limitation that the fuel that is introduced is not treated only the capability of operating with such untreated fuels. Accordingly, Examiner is unsure how the obviated system/process is not capable of operating with unprocessed fuels, as the obviated system/process is the same as the claimed system/process (wherein Keegan et al. is relied upon to render obvious the use of different fuels).

Furthermore, as applied to the product claims only:

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson*, 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art

structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Accordingly, Examiner submits that the argument is not directed at the claimed invention (as the claim language only requires the capability of operating with a fuel that does not undergo prior treatment, not that the prior treatment does not occur). In such a manner, Appellant is reading the claim language too narrowly, and thus the arguments presented are not directed to the claim language and thus is not found to be persuasive.

**Issue C-2-b – Appellant again argues (this time specifically with respect to claim 63, and thus its dependents) that Examiner has made improper reference combinations and has failed to address every limitation of the claimed invention and thus has not met the *prima facie* case of obviousness.**

Examiner respectfully disagrees and submits that such a *prima facie* case of unpatentability has been met by the rejection set forth above. At this point, it is noted that Appellant has not provided any argument, proof, or reasoning as to how the rejection does not encompass the claim limitations. Furthermore, as set forth above, it is submitted that the references are combinable. Again, it is noted that Appellant's arguments are answered in full in the appropriate subsections of Issue C below.

**Issue C-2-b-i – Appellant merely uses this section to recite the claim limitations.**

It is submitted that no arguments are provided within this section, and thus no response is provided.

**Issue C-2-b-ii – Appellant applies the same arguments as applied to claims 62.**

Examiner incorporates the response to the arguments as addressed to claims 62 herein, as applied to claim 63 (not reiterated for brevity's sake).

**Issue C-2-c – Appellant uses this section to recite the claim limitations and states that the arguments as applied to claims 62 apply to claim 64.**

Examiner incorporates the response to the arguments as addressed to claims 62 herein, as applied to claim 64 (not reiterated for brevity's sake).

**Issue C-2-d – Appellant argues that (a) the teaching away in Isenberg is not irrelevant, (b) that the combination of Isenberg and Cable is improper due to such a teaching away and that such combination fails to take into account every part of the prior art reference, (c) cites col. 2, lines 14-45 of Cable '285 (talking about cell**

**performance degradation, and states that ceria containing electrodes experienced rapid performance degradation and thus the ceria teaching cannot be combined with Cable), and (d) then reiterates the previous arguments (that the Cable/Isenberg combination is not proper due to the teaching away, that Cable's electrode/electrolyte are not bonded, as Cable criticizes bonding, and that Keegan does not teach of using untreated fuels).**

Examiner respectfully disagrees.

With respect to (a):

Comparing Isenberg '329 with Cable '903:

It is once again emphasized that Cable '903 does not mention Isenberg '329, and thus cannot be seen to teach away from the combination of with Isenberg '329. Furthermore, it is noted that within the current rejection, Isenberg '329 is only being relied upon to provide ceria into the pores for sulfur tolerance purposes. Accordingly, the combination is with respect to the sulfur tolerance, and not direct towards the anode/electrolyte interface. Furthermore, it is noted that the inclusion of ceria in an electrode, regardless of the anode/electrolyte of interface, would provide the same predictable affect to the electrode - sulfur tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teaching within Isenberg, with respect to ceria improving sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristic of improved sulfur tolerance would be expected. Appellant has not given any proof or reasoning as to how the electrolyte/anode interface



would affect the characteristic of ceria for sulfur tolerance or how the results of this combination would yield any unexpected results.

Comparing Isenberg '776 with Cable '903:

Again it is emphasized Isenberg '776 is *not* relied upon in the rejection; however, the portion wherein Cable '903 criticizes Isenberg '776 is examined. The binding of Isenberg '776 that Cable '903 criticizes is with respect to a ceramic coating binding the electrolyte to metal particles, wherein the thermal expansion mismatch is drawn to the difference between ceramic and metal (col. 2, lines 30-43). However, it is noted that electronically conducting particles are only optional in Cable '903 (i.e. are not necessarily present within the anode) (col. 5, lines 23-36). Accordingly, bonding between the electronic conductors (metals) and electrolyte (a ceramic material) is not necessarily present. Accordingly, the condition which Cable '903 is criticizing (about Isenberg '776) may not even exist. Accordingly, arguments as to the fact that Cable '903 criticizes the metal/ceramic expansion differences (within the electrode and electrolyte, respectively) is not germane to the rejection of record, as metal expansion may not problem within Cable '903 (as its inclusion is not necessary). Accordingly, the argument is not seen to be relevant to the rejection, and is unconvincing.

Comparing Isenberg '329 to Cable '285:

It is set forth that only Isenberg '329 is compared to Cable '285 (for sake for responding to the arguments), as Cable mentions Isenberg '329 and Isenberg '776, wherein the latter is not relied upon in the rejection. First it is noted that such an argument (with respect to the combination of Cable '285 and Isenberg '329) is not

applicable to independent claims 62 and 63, as Cable '285 is not relied upon in the rejection for claims 62 and 63. However, since claim 64 relies on Cable '285, such a response to the arguments is set forth as applicable to only claim 64. It is noted that the arguments directed towards the combination of Cable '285 and Isenberg '329 are irrelevant to the rejection at hand. First, within the current rejection, Isenberg '329 is only being relied upon to provide ceria into the pores for sulfur tolerance purposes. Second, Cable '903 (not Cable '285) is relied upon as the primary reference, wherein it has clearly been set forth above why Cable '903 is still combinable with Isenberg '329 (for non-limiting example, the fact that Cable '903 never mentions Isenberg '329; see above for full details). Accordingly, such an arguments with respect to Isenberg '329 combined with Cable '285 are irrelevant.

With respect to (b):

As set forth within the response to the above (to Issue C-2-a-ii-B), the references are not seen to teach away from one another. Full details as to such a reasoning can be found in the response to arguments of Issue C-2-a-ii-B. However such a position is summarized herein for clarity's sake.

Comparing Isenberg '329 with Cable '903:

It is once again emphasized that Cable '903 does not mention Isenberg '329, and thus cannot be seen to teach away from the combination of with Isenberg '329.

Comparing Isenberg '776 with Cable '903:

Again it is emphasized Isenberg '776 is *not* relied upon in the rejection. Even so, the portion wherein Isenberg '776's interface is being criticized can be taken into

consideration. Although Cable '903 may teach that there may be disadvantages to the bonding particular to Isenberg '776 (ceramic-metal interface), this does not specifically constitute a teaching away. It does not negate the fact that Cable '903 teaches an example wherein the anode material is coated directly to the surface of the electrolyte (col. 5, lines 5-22). Fig. 1, which is embodied by Cable'903, shows direct contact between the anode and the electrolyte as well. It is noted that such a contact constitutes a bonding of some sort. For example, the pressure of the unit cell stack would bond the two and as to prevent reactant leakage. Furthermore, at the very least, the direct contact at least constitutes an electrically bound anode and electrolyte (as if this is not the case, no power would be able to be generated from the fuel cell). Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Also, limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Zletz*, 893F.2d 319, 321-22, 13 USPQ2d, 1320, 1322 (Fed. Cir. 1989). Accordingly, as Appellant does not clearly specify the type of bonding claimed such interpretations are applicable and read on the claim language.

Furthermore, although a microslip layer may be preferred in Cable '903, its disclosure on a whole clearly shows that they recognize that a fuel cell without such a layer would still be known to work to one of ordinary skill in the art (as seen in fig. 1 an exemplified in col. 5, lines 5-9). Accordingly, consideration of the entire reference of Cable '903 would include a teaching of a directly bonded anode/electrolyte. Additionally, Examiner would like to submit that Cable '903 (even with the microslip

layer) is not teaching that anode material is not being bonded directly to the electrolyte. The microslip material itself is just anode material, wherein it is embodied that the electrode is made up of the microslip layer (for example [17] on the anode side) with the bulk electrode (for example [4] anode), wherein this is a continuous layer with a porosity gradient within the anode material (col. 6, lines 1-26). Accordingly, in this manner, it is seen that Cable '903 is merely teaching a porosity gradient through the electrode active material, and in such a manner, it does not constitute a teaching away of having anode material bonded to the electrolyte. Again, it is emphasized that the term "bound" is broader than Appellant is reading it to be (and that just because Cable '903 does not teaching of the same type of bonding as Isenberg '329/'776, does not mean that it is not bound in some manner).

Comparing Isenberg '329 to Cable '285:

It is set forth that only Isenberg '329 is compared to Cable '285 (for sake for responding to the arguments), as Cable mentions Isenberg '329 and Isenberg '776, wherein the latter is not relied upon in the rejection. First it is noted that such an argument (with respect to the combination of Cable '285 and Isenberg '329) is not applicable to independent claims 62 and 63, as Cable '285 is not relied upon in the rejection for claims 62 and 63. However, since claim 64 relies on Cable '285, such a response to the arguments is set forth as applicable to only claim 64. Just because the interfaces taught by Cable '285 and Isenberg '329 are different does not mean that they are not combinable. Cable's criticism of the metal/electrolyte interface is due thermal expansion mismatch (col. 1, lines 55-66). However, the portion relied upon in Cable

'285 has to do with sulfur tolerance, as is the portion that is relied upon in Isenberg '329. Accordingly, both are used for the same reason (sulfur tolerance), and accordingly can be combined with respect to such teaching. Accordingly, although the electrolyte/anode interface is different in Isenberg '329 and Cable '285, both pieces deal with sulfur tolerance. Since both similarly deal with sulfur tolerance, the reliance on both teachings with respect to sulfur tolerance is combinable on this front, as sulfur tolerance is what the references' principle of operation is centered around. Furthermore, it is noted that although Cable '285 does criticize Isenberg '329, within such portion set forth by Appellant, Cable '285 does recognize itself that cerium oxide (ceria) does help reduce cell degradation (col. 2, lines 40-45). Accordingly, although the anode/electrolyte interface of Isenberg '329 is criticized, Cable '285 specifically recognizes that cerium oxide keeps a solid oxide fuel cell from degrading, and thus the inclusion would be obvious, as Cable '285 specifically recognizes the use of ceria to prevent performance degradation. Again it is emphasized that the both teachings drawn from Cable '285 and Isenberg '329 deal with sulfur tolerance. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teachings with respect to sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristics of improved sulfur tolerance would be expected, as the teachings are drawn to the same characteristic (regardless as to the anode/electrolyte interface). Appellant has not given any proof or reasoning as to how the electrolyte/anode interface would affect the characteristics of sulfur tolerance or how the results of the combination set forth would yield any unexpected results.

In such a manner, Examiner submits that Appellant is the one not looking at the entirety of the reference (Isenberg '329) (focusing only to the slightly inferior anode/electrolyte interface, as set forth in Cable '285 not specifically mentioned in Cable '903, without considering its teaching with respect to sulfur tolerance). It is noted that a "prior art reference that "teaches away" from the claimed invention is a significant factor to be considered in determining obviousness; however, "the nature of the teaching is highly relevant and must be weighed in substance. A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *In re Gurley*, 27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)"; see MPEP §2145(x)(D)(1). Accordingly, Appellant is not considering the nature of the case as a whole by not considering the whole teaching (especially since Cable '285 specifically recognizes that the inclusion of ceria does slow down cell degradation, as set forth above).

With respect to (c):

It is again emphasized that Isenberg '329 (relied upon render obvious the inclusion of ceria) is not criticized in Cable '903 (the primary reference). Accordingly, such an argument with respect to such combination is not relevant to the rejections, as Isenberg '329 is not mentioned and Isenberg '776, which is mentioned, is not relied upon within the rejection. Furthermore, it is noted that Cable '285 is not relied upon to reject claims 62 and 63, and thus any arguments with respect to Cable '285 as applied to claims 62 and 63 are irrelevant, as it is not used in the rejection of record to reject those claims. However, such an argument is applicable to claim 64, wherein it is noted

that although Cable '285 does criticize Isenberg, within such portion set forth by Appellant Cable '285 does recognize itself that cerium oxide (ceria) does help reduce degradation (col. 2, lines 40-45). Accordingly, although the anode/electrolyte interface of Isenberg is criticized, Cable '285 specifically recognizes that cerium oxide keeps a solid oxide fuel cell from degrading, and thus the inclusion would be obvious, as Cable '285 specifically recognizes the use of ceria to prevent performance degradation. Accordingly, it is seen that one of ordinary skill in the art would be able to combine the teachings with respect to sulfur tolerance, and apply it to other solid oxide systems, wherein the same characteristics of improved sulfur tolerance would be expected, as the teachings are drawn to the same characteristic (regardless as to the anode/electrolyte interface). Appellant has not given any proof or reasoning as to how the electrolyte/anode interface would affect the characteristics of sulfur tolerance or how the results of the combination set forth would yield any unexpected results.

In such a manner, Examiner submits that Appellant is the one not looking at the entirety of the reference (Isenberg '329) (focusing only to the slightly inferior anode/electrolyte interface, as set forth in Cable '285 not specifically mentioned in Cable '903, without considering its teaching with respect to sulfur tolerance). It is noted that a "prior art reference that "teaches away" from the claimed invention is a significant factor to be considered in determining obviousness; however, "the nature of the teaching is highly relevant and must be weighed in substance. A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *In re Gurley*, 27 F.3d 551,

554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)"; see MPEP §2145(x)(D)(1). Accordingly, Appellant is not considering the nature of the case as a whole by not considering the whole teaching (especially since Cable '285 specifically recognizes that the inclusion of ceria does slow down cell degradation, as set forth above).

With respect to (d): Such arguments have been addressed above in full and are included herein, but not reiterated herein for brevity's sake.

**Issue C-2-e (i) to (iv) – Appellant argues that the rejections to the dependent claims should be withdrawn (for the same reasons as the independent claims they are dependent off of).**

Examiner submits that Appellant has not argued how the combination is not proper. Therefore, the Examiner maintains the obviousness rejections and upholds the rejection of the independent claim, as above.

**Thus the claimed invention is not held to be patentably distinct from the teachings of the prior art references relied upon in the rejections, and the rejections stand.**

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the reasons above, it is believed that the rejections should be sustained.

Respectfully submitted,

Eugenia Wang



Art Unit: 1795

Junior Examiner –Division 1795

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